

HELICOPTERS & TERRAPINS

SHARE SPACE AT
NAS Patuxent River



MH-60 Sea Hawk helicopter.
MC2 John Philip Wagner Jr.



Hatchling Diamondback terrapins released from a predator exclusion device (PED).
Maria Ceballos

Pilots & Natural Resources Staff Find Creative Compromise & Further Turtle Research

Helicopter pilots are not the only ones seeking out the “confined area” landing zones at Naval Air Station Patuxent River (NAS Pax River) Maryland. The Northern Diamondback terrapin (*Malepemys terrapin terrapin*) favors some of the same characteristics of sites for its nesting areas. So when the NAS Pax River Natural Resources Program (NRP) initiated terrapin nest surveys and protection efforts, they worked with local helicopter squadrons to create, resource and execute solutions that balance mission demands and natural resources requirements.

THE BASICS ABOUT **Naval Air Station Patuxent River**

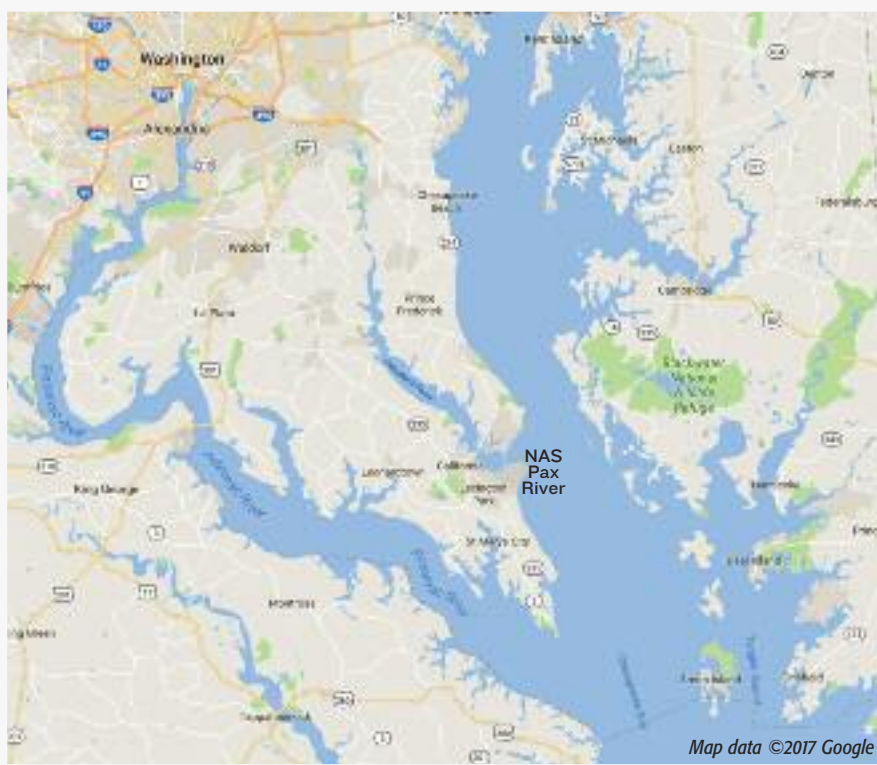
NAS PAX RIVER is located in St. Mary's County, Maryland. The primary areas surveyed for the terrapins fall within the main NAS Pax River and the Naval Recreation Center Solomons Island parcels. These two facilities are located on the Chesapeake Bay at the mouth of the Patuxent River and encompass roughly 7,000 (non-contiguous) acres and just over nine miles of shoreline.

NAS Pax River is home to the Naval Air Systems Command (NAVAIR) and Naval Air Warfare Center Aircraft Division (NAWCAD) headquarters. It also includes the U.S. Naval Test Pilot School (USNTPS) and Naval Air Station Patuxent River's Search and Rescue Team (NAS PAX SAR). The USNTPS is the only military test pilot school in the world that includes a rotary wing (helicopter) training syllabus, which includes instructing and demonstrating helicopter handling characteristics to the U.S. Navy, Army, Air Force, Coast Guard and allied nation exchange pilots.

Pax River's NRP falls within the Naval Facilities Engineering Command's (NAVFAC) Public Works Department, Washington region. The NRP is part of the Conservation and Environmental Planning Branch (Compliance Branch), along with Cultural Resources, National Environmental Policy Act compliance and Environmental Restoration programs. Its permanent staff has expertise

in fisheries, wildlife management, forestry, zoology, geology, ecology, wetlands and outdoor recreation.

The permanent staff is supplemented by part-time and temporary staff when activity requirements of the Conservation Branch periodically increase. Supplemental staff can include one to five seasonal temporary employees, one to two high school cooperative study students and one to two college interns per year. In recent years, these temporary employees have been brought in through the Student Conservation Association (SCA) and a Morale, Welfare and Recreation Work Wise Teens program. The SCA has provided resource assistants to the NRP since 1995.



Helicopter Training

Helicopter "confined area" landing zones aboard NAS Pax River are used by both the USNTPS and NAS PAX SAR. The USNTPS uses the landing zones to instruct and demonstrate helicopter handling characteristics to the U.S. Navy, Army, Air Force, Coast Guard and allied nation exchange pilots. The NAS PAX SAR team unit utilizes the landing zones to maintain proficiency in performing heli-

copter overland rescue operations in confined areas. Maneuvering a helicopter in confined areas demands an intense level of coordination between the pilot and crew, and must be practiced on a regular basis to maintain the skill required to safely and expeditiously perform these operations. Locations to conduct this training are confined to military installations.

SOME OF THE SAME **characteristics** THAT THE PILOTS FAVORED MADE THE AREA A PREFERRED TERRAPIN **nesting area** AS WELL.

Confined area landing zones have small yet sufficient openings in the trees and other vegetation to allow landing while also providing necessary training for challenging landing conditions. Areas can be within a ring of trees or on beach areas between trees and water. A favorite landing zone on NAS Pax River was near a beach and dune area that naturally had these characteristics.

Terrapin nest surveys revealed that it wasn't only the helicopter pilots who liked the area around the landing zone.

Some of the same characteristics that the pilots favored made the area a preferred terrapin nesting area as well.

Northern Diamondback Terrapins

Diamondback terrapins are North America's only estuarine turtle—able to tolerate a wide range of salinity levels. There are multiple populations found along the east coast, from Massachusetts to Florida, and into the Gulf of Mexico. The Northern Diamondback terrapin population has

long found the tributaries and marshes in Chesapeake Bay to be an ideal habitat mix of sandy beaches, moderate shoreline vegetation and salt marsh.

Preferred nesting areas for terrapins have loose sand or gravel that is easy to dig for a nest, open enough for sun exposure to keep the nests warm but with some vegetation to discourage predators and provide cooler margins. Proximity to marsh areas offers cover and feeding areas for terrapin hatchlings.



MH-60 Sea Hawk helicopter.

MC1 Benjamin A. Lewis

Northern Diamondback Terrapins IN MARYLAND

THE NORTHERN DIAMONDBACK

terrapin (*Malaclemys terrapin terrapin*) is an iconic species in Maryland and the Chesapeake Bay. They are the official mascot of the University of Maryland and the state reptile. Terrapins were an abundant food source for Native Americans and early colonists living around the Bay. When they became the main ingredient in a gourmet soup harvesting soared, placing heavy demands on a species that is slow to mature and reproduce.



Although female terrapins might nest up to three times per season, egg and hatchling survival is perilously low.

Female terrapins in Chesapeake Bay mature between eight and 13 years old. Although they might nest up to three times per season, egg and hatchling survival is perilously low. It is estimated that only two percent of eggs hatch. Eggs in unprotected nests fall prey to raccoons, foxes, skunks, ants, maggots and grass roots. The hatchlings that make it out of the nest frequently are eaten by gulls, crows, herons and other predators.

Those terrapins that survive then face additional human threats from crab pots, boat propellers, illegal harvest for food and pet sales and habitat loss.

Climate change is contributing to habitat loss, posing multiple threats to the species. As water levels rise, the beaches and marshes that once provided nesting and feeding habitat are inundated. The rising waters also contribute to shoreline erosion, which landowners have often tried to address with bulkheads and riprap, effectively blocking access to nesting sites. Maryland's Living Shorelines Protection Act, passed in 2008, requires nonstructural stabilization measures for shoreline protection—one step toward protecting habitat of many species in Chesapeake Bay. For more information about living shorelines, visit <http://ccrm.vims.edu/livingshorelines/index.html>.



A hatchling rests on moss near the site of emergence.
Jenna Cole

Terrapin populations in Chesapeake Bay are known to have declined significantly over several decades, but clear estimates of their numbers are elusive. Threats to terrapins once included over-harvesting and continue to include habitat loss, climate change, invasive species, predation, drowning in crab pots and boat propeller strikes. Some states, including Maryland, have been sufficiently concerned about declining numbers that they have prohibited or limited commercial harvesting and now require that crab pots include by-catch reduction devices (devices are effective at letting crabs in but keeping terrapins out). Concern for the species is also reflected by its listing in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Appendix II) which regulates their export.

NAS Pax River has suitable terrapin habitat and the species is listed as an occurring species in the installation's Integrated Natural Resources Management Plan (INRMP). Lacking any federal or state designation as threatened or endangered, surveys to determine numbers and locations of nests are not mandated. However, during meetings among natural resources agency partners to discuss INRMP updates, the U.S. Fish and Wildlife Service and Maryland Department of Natural Resources representatives noted that survey data from NAS Pax River would be a valuable contribution to ongoing terrapin research.

Survey data FROM NAS PAX RIVER WOULD BE A VALUABLE CONTRIBUTION TO ONGOING TERRAPIN **research**.

Nest Surveys

Coincident with the request to collect terrapin data on the installation, a new intern joined the base's NRP in 2013 through a SCA position. The intern, Sarah Funck, had a background in herpetology and was hired to prepare NAS Pax River's contribution to the Maryland Amphibian and Reptile Atlas, also called the "Herp Atlas." Because Funck also had conducted sea turtle nest surveys and was interested in terrapin habitat on the installation, she took the lead in initiating Pax River's Diamondback terrapin nest monitoring effort.

To address the scant information regarding the terrapin population at NAS Pax River, the project pursued four objectives:

1. Identify important nesting sites used by terrapins.
2. Quantify current nest predation rates.

3. Evaluate the success of predator exclusion devices.
4. Document nest survivorship using hatching success calculations.

To be able to cover the most suitable nesting habitat on the base, Funck needed help. She recruited and trained volunteers, both civilian and military, who could participate in daily beach surveys to locate nests. In 2013, the project's first year, nesting surveys started on 1 June and happened every day, seven days a week. In subsequent years, the starting date moved to 1 May, with volunteer training starting in April. Volunteer numbers ranged from 30 regular participants to as many as 100 registered participants.



An undisturbed terrapin nest
(prior to excavation).

LS2 Robert Russell



A Diamondback terrapin nest that has been
excavated and documented prior to reburial.

LS2 Robert Russell

Turtle, Terrapin, Tortoise

THESE THREE TERMS are common names for related species. All are reptiles that fall within the taxonomic order *Testudines*. Tortoises are typically thought of as land dwellers, but some land-dwelling species within *Testudines* are referred to as turtles (e.g., box turtles). In a general sense, turtles (including terrapins) spend most of their time in water. Sea turtles live in marine waters, while most other turtles live in fresh water. Terrapins can tolerate a wide range of salinity from sea water to fresh water, although their typical habitat falls within brackish, estuarine waters that are a mix of sea and fresh water.

Terrapin is a common name believed to come from an Algonquian word for turtle. It typically refers to *Malaclemys terrapin*—a species of turtle found in brackish waters along the east coast of the United States from Massachusetts to the Florida Keys and into the Gulf of Mexico.

To give some sense of the varied and changing terms associated with this order, the International Union for Conservation of Nature's Species Survival Commission has a Turtle Taxonomy Working Group (TTWG) that regularly revisits turtle taxonomy. The TTWG issued a seventh edition of its *Turtles of the World* annotated checklist in 2014 (available for download at www.iucn-tftsg.org/wp-content/uploads/file/Accounts/crm_5_000_checklist_v7_2014.pdf).



The survey teams focused on three areas of the installation—Beach House Beach, Hog Point and Cedar Point. Team members learned to look for sometimes subtle clues to nesting activity including crawl tracks and disturbed sand and gravel. If crawl signs were noted, volunteers cautiously searched for a nesting female to avoid interrupting egg laying.

On the rare occasion that volunteer teams came upon a nesting female, they would maintain a safe distance until nesting was completed. As the female left the nest, team members would then intercept the female to weigh and measure her. They also scanned her for any shell markings. Any markings found were recorded and if none were evident, new marks were added. These marks help researchers track females over time

and understand more about terrapin ages, nesting habits and nesting frequency.

When a nest was located, the team documented its location and habitat type.



Map data ©2017 Google

THE ONCE-A-DAY EFFORT TO FIND NESTS DOUBLED TO **twice-a-day** WHEN IT WAS TIME TO **monitor** THE NESTS FOR HATCHLINGS.

The nest was carefully excavated to determine if the eggs could be counted, weighed and measured. If the eggs were still a pink hue they could be handled with extreme care using gloves. After data collection, eggs that were moved were replaced in the same order and orientation in which they were found and then reburied. If the eggs were a chalky white, they are left in-place to avoid disturbing the embryo.

Finally, the survey team would secure a crate (predator exclusion device) over the nest to protect it from predators. The crates were labeled with identification tags that included a nest number and estimated date of egg-laying. The crates also were equipped with wire mesh, or hardware cloth, that

would help to keep terrapin hatchlings inside the crate while also keeping raccoon paws out. For some nests, predators reached the nests before the survey teams. Nest location and predator tracks were recorded for these destroyed nests.

The once-a-day effort to find nests doubled to twice-a-day when it was time to monitor the nests for hatchlings. Estimated incubation time for terrapin eggs is 60 days and can vary depending on weather conditions. Teams would begin nest monitoring 50 days after the earliest nest had been discovered. Terrapin hatchlings can take several days to emerge from the nest after leaving the eggshell, meaning that an accurate hatching date could not be determined at the surface of the nest. To record an exact hatching date, the top egg of the nest was exposed once a day and then reburied and re-caged.

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A volunteer measuring terrapin eggs and collecting data.
LT Ryan Wu



An egg tooth on the tip of the hatchling's nose helps to break through the eggshell during hatching.
Jenna Cole



Nests need approximately 60 days to incubate before hatching occurs and can hold over 20 eggs.
Sarah Funck



A prototype of the new wire PED (left) and an original black PED.
Natasha Vila



MH-60R Sea Hawk helicopter.
Petty Officer 2nd Class Kevin V. Cunningham



A female Diamondback terrapin that
 has been captured, tagged and released.
LS2 Robert Russell



Hatchling terrapins that have
 just emerged from the nest.
LS2 Robert Russell



After being released from a PED, the hatchlings head into the nearby brush, quickly blending into their surroundings.

Natasha Vila



UH-72 Lakota helicopter.



Diamondback terrapins are about the size of a quarter upon hatching and have a myriad of obstacles to overcome as they grow.

Sarah Funck

MH-60 Sea Hawk helicopters.

MC3 Jameson E. Lynch



THE BASICS ABOUT **MH-60 & UH-72 Helicopters**

BOTH MH-60 SEA Hawk and UH-72 Lakota helicopters use the beach landing zones aboard NAS Pax River.

The Sea Hawk is twin-engine, medium lift, utility or assault helicopter used for anti-submarine warfare, search and rescue, drug interdiction, anti-ship warfare, cargo lift and special operations. The Sea Hawk is an airborne platform based aboard cruisers, destroyers and frigates and deploys sonobuoys (sonic detectors) and torpedoes in an anti-submarine role. These helicopters also extend the range of the ship's radar capabilities.

The Lakota is a twin-engine, light duty, unarmed helicopter optimized for routine air operations to include civil support, air transport, medical evacuation and search and rescue, in a permissive, non-hostile environment. The UH-72 is capable of transporting eight passengers or two stretchers and medical crew.



MH-60 Sea Hawk helicopter.



UH-72 Lakota helicopter.

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As hatchlings began to emerge from the nest, they were weighed, measured and then released on site. This could continue over several days until it was determined that any remaining eggs were no longer viable. Hatching success was measured by the number of hatchlings from a total number of eggs.

A Challenge Emerges

As demanding as the basic nest survey and monitoring efforts were, workload was about to increase. The project team returned to a nesting area to discover crates blown around the beach, up the dunes and into the water. This is when they realized the prime terrapin nesting area overlapped an established helicopter landing zone. Not only would the displaced crates not protect the nests, they posed a “foreign object debris” hazard to the helicopter crews.

Officials with the air station's NRP and the NAVAIR Ranges Sustainability Office met with helicopter squadron leadership to discuss the survey objectives and request that the helicopter pilots use other landing zones during the nesting season. At the time, NAS Pax River

had three “confined area” landing zones for helicopters, however, because of resource limitations, it was not possible to maintain two of these three sites and they became overgrown. The beach landing zone was the only real clear landing zone where the local helicopter squadrons could practice.

Due to the limited number of accessible landing zones, an initial compromise was reached. Pilots would try to reduce the demands on the specific landing zone but that when it was needed, the nest cages had to be temporarily removed. Until an alternative could be found, the NRP staff agreed.

Although the compromise allowed the surveys to continue, it generated additional tasks. During nesting season, the survey team would receive advance notifications anywhere from eight hours to 30 minutes before cages needed to be removed. Team members would get to the landing zone to dig out the partially buried cages before helicopters moved in. They then needed to replace them before dark when predators would be more likely to dig up the eggs.

THE NEW SITE LET US DO OUR JOB OF SUPPORTING THE **mission** WHILE **saving** THE TURTLES.—KYLE RAMBO

Seeking Solutions

After multiple survey seasons, NRP staff devised an approach to establishing an acceptable alternative landing zone. The site needed to satisfy many of the characteristics the helicopter pilots wanted for their turf landings but not serve as prime nesting habitat for the terrapins. One challenge was clearing vegetation and leveling the landing area to meet specifications. These included size, shape, surface type and obstructions preferred for pilot training.

When station funds and the acquisition process could not be relied upon to clear these other two sites, the NRP staff cleared them. Although NRP staff could clear the vegetation, they needed bigger equipment to fill and level holes and ruts so that helicopters could land safely. They also had limited time to complete the work before the next nesting season began.

When on-base construction crews could not get heavy equipment to the site within the timeframe, NRP looked for a different approach. As Kyle Rambo, Director of Environmental Planning and Conservation at Pax River, said “We needed a constructive, creative and flexible alternative.”

They turned to the installation’s Agricultural Out-lease farmer for help. Military installations, including NAS Pax River, can lease land to farmers for agricultural purposes that is not being used to support the mission. As part of the lease, the farmers can provide in-kind services. With smaller tractors and equipment, the farmer on Pax River accessed the existing overgrown, upland landing site and

completed the necessary work before the nesting season began. A new, comparable beach landing zone—complete with a terrapin exclusion fence to ensure the new site did not become a nesting area—was then brought on-line by NRP staff and SCA volunteers. By providing two alternate landing zones, beach access could be rerouted to a new landing zone until the nesting season was over—relieving some of the demands on the one useable “confined area” landing zone on the beach.

Rambo commented on the new site, “It didn’t deny access to areas the terrapins had used but did deny access to an area that might become attractive. The new site let us do our job of supporting the mission while saving the turtles.”



Terrapin hatchling
prior to release.
LS2 Robert Russell



Hatchling terrapin entering the
Patuxent River after being weighed and
measured by NAS Pax River volunteers.

Maria Ceballos

The Student Conservation Association & THE NAVY

THE SCA IS a national non-profit that engages both high school-age and young adult volunteers in conserving natural resources through internships, conservation jobs and crew experiences. Founded in 1957, the SCA has grown from 53 volunteers working in two national parks to nearly 75,000 members in 2014 across the United States. SCA has formed partnerships with governmental agencies, environmental groups and corporations. They complete projects in every conservation discipline, including ecological restoration, Geographic Information Systems/Global Positioning Systems, wildlife management and interpretation.

The Navy has employed several SCA interns on U.S. installations including:

1. NAS Patuxent River
2. NAS Jacksonville

3. Naval Station Guantanamo Bay
4. NAVFAC Northwest
5. NAVFAC Marianas
6. Marine Corps Base Camp Lejeune

The SCA also works with other Services within the Department of Defense. For more about SCA, go to their website at www.thesca.org.



Results & Value

During 2013, teams identified 98 nests, 97 of which were on Beach House Beach. They installed protective cages on 29 of the 98 nests. None of the protected nests were disturbed by large predators and, based on egg to hatchling counts, the hatching success of the protected nests was just over 93 percent. Of identified but unprotected nests, only five had successful hatches. Size and weight measurements were taken on 236 of the hatchlings. By 2015, teams caged 70 nests, which produced over 700 successful hatchlings. Measurements were collected on approximately 685 of those hatchlings.

Chris Rowe, researcher from the University of Maryland's Chesapeake Biological Laboratory, commented that the "NAS Pax River terrapin volunteer survey and nest protection program is important. Few populations or sub-populations in the Bay are currently being monitored, so the data they collect will be useful if we expect to evaluate population trends in the future."

He also noted that long-term data sets will be critical to characterizing population changes. "This is where efforts

like that at NAS Pax River are very important—if continued over a long enough period of time, trends may emerge that can inform scientists, regulators and conservationists of the trajectory of the population," said Rowe.

Jackie Smith, natural resources specialist at Pax River, pointed out that it is critical to have data on species that occur on the installation. It is important to know what direction a species population might be headed and to know if any other work being funded could affect it. "This kind of work helps us stay ahead and be prepared. It just makes sense."

Interns & Volunteers are Critical Assets

The labor-intensive nest and hatchling surveys could not be done without SCA interns and dedicated volunteers. The SCA interns provide a valuable supplement to NRP staff, spending 16-week assignments conducting surveys, outreach and field support on the installation.

THIS KIND OF WORK HELPS US STAY **ahead** AND BE PREPARED.
IT JUST MAKES **sense**.—JACKIE SMITH

Three interns—Sarah Funck, Michael Irvin and Natasha Norton—have supported the terrapin efforts. (For more on the SCA program and the Navy, see our sidebar “The Student Conservation Association & the Navy.”) The interns have helped to train and coordinate the volunteers who are then part of the survey

team. Volunteers have included individuals from all parts of Pax River, including the helicopter community, the Health Division, Pax River families and many others.

The teams go out in all weather, trudging across the sand and enduring the heat, wind and insects,

to help further knowledge about the Diamondback terrapin.

Smith noted, “The volunteer coordination efforts alone would tax the existing department workload. We could not do this project without the SCA interns and volunteers.” [!\[\]\(339a16584d5da0f0a3ca4e9ec17bf6a1_img.jpg\)](#)

Jackie Smith
Naval Air Station Patuxent River
301-757-0007
DSN: 757-0007
jacqueline.c.smith@navy.mil

